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USING PANEL UNIT ROOT TESTS TO EVALUATE THE INCOME CONVERGENCE HYPOTHESIS IN MIDDELE EAST AND NORTH AFRICA COUNTRIES

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Abstract

This article aims at testing the convergence hypothesis in MENA region using new tests of a unit root in panel data. Quah (1994, 1998), Evans & Karras (1996) and Bernard & Jones (1996) recommend this technique to evaluate the income convergence hypothesis. According to them it avoids econometric problems of the cross-countries growth regressions testing convergence and sample bias of the multivariate cointegration techniques. We test both the absolute and the conditional convergence with panel unit roots tests using the Summers and Heston's data 5.2 and 6.1 on the periods of 1960 to 1990 and from 1960 to 2000. The absolute convergence hypothesis use panel unit roots test with no fixed individual effects. The catching-up hypothesis is accepted for most groups of the region countries during both periods (1960 to 1990 and 1960 to 2000). If we allow a break in the unit root tests, the hypothesis is accepted for more groups. The conditional convergence requires panel unit root tests with fixed individual effects. Again, during the whole periods, the conditional convergence is accepted for the major part of the remaining groups of MENA countries.

Keywords: conditional convergence, catching-up, panel unit root tests, Middle East and North Africa.

Résumé

Cet article test la convergence au sein de la zone MENA grâce aux nouveaux tests de racine unitaire sur données de panel. Quah (1994), Evans & Karras (1996, 1998) et Bernard & Jones (1996) recommandent cette technique pour évaluer l'hypothèse de convergence des revenus, cela permet d'éviter des problèmes de biais de cointégration. Nous testons la convergence absolue et conditionnelle en utilisant les données de Summers et Heston's 5.2 et 6.1 durant les périodes 1960-1990 et 1960-2000. La convergence absolue est évaluée par l'application des tests de racines unitaire sans effets fixes. L'hypothèse de rattrapage est acceptée pour la plupart des groupes de pays de la région durant les deux périodes d'études (1960-1990 et 1960-2000). L'introduction d'une rupture dans les tests de racines unitaire permet d'accepter l'hypothèse de convergence pour plus de groupes. La recherche de convergence conditionnelle est faite par des tests de racine unitaires avec effets fixes individuels. Cette dernière est acceptée pour la plupart du reste de groupes de pays de la zone.

Mots clés: Convergence conditionnelle, rattrapage, testes de racine unitaire sur données de panel, Moyen orient et Afrique du nord.

JEL Classification Numbers: B23, F1, 01, 047, 05

1- INTRODUCTION

The Middle East and North Africa (MENA) region is rich in natural and human resources, labor, GDP, and population. Its countries vary, in some cases considerably, in economic size, population, public/private sector balances, and financial and natural resources. Several countries in the region have made significant progress in adjustment and reform, and are qualified to have some catching-up with developed countries. However, to our knowledge, there is no formal proof of such result. This paper aims to apply new techniques using a panel data approach to test convergence hypothesis in the region for twenty countries groups during the period 1960 to 1990 and for seventeen groups during 1960 to 2000.

Recently, Quah (1994), Evans & Karras (1996), Bernard & Jones (1996) and Evans (1998) develop formal panel unit root tests to evaluate the income convergence hypothesis. This article uses these new unit root tests to examine the convergence hypothesis in some MENA regions groups of countries. We consider both the absolute and conditional convergence with panel unit root tests.

The absolute convergence hypothesis use panel unit roots test with no fixed individual effects. The catching-up hypothesis is accepted for fifteens groups during the period of 1960 to 1990 (MENA, Maghreb-1, Maghreb-2, Middle East-1, Middle East-2, Middle East-3, Middle East-4, Middle East-5, Middle East-7, Non-Oil countries-1, Non-Oil countries-2, Non-Oil countries-3, Non-Oil countries-4, Non-Oil countries-6 and Non-Oil countries-7). It is also accepted for two groups Oil countries-1 and Oil countries-2 if we allow a break in 1980. The absolute convergence hypothesis is accepted during the second period 1960 to 2000 for twelve groups (MENA, Maghreb-1, Maghreb-2, Middle East-1, Middle East-2, Middle East-3, Middle East-4 and 5, Middle East-6, Middle East-7, Non-Oil countries-1, Non-Oil countries-2 and Non-Oil countries-3). With a break in 1976, 1965 and 1970, we accept the catching-up hypothesis for the respectively groups Oil countries-3, Non-Oil countries-5 and Non-Oil countries-6.

The conditional convergence requires panel unit root tests with fixed individual effects. Conditional convergence is accepted, during the whole period 1960 to 1990 for two of the

three remaining groups Middle East-6, Oil countries-3 and Non oil-countries-5. It's also established for one of the two lasting groups Non oil-countries-4 and Non oil-countries-7, during 1960 to 2000.

The remainder of the paper is organized as follows. Section 2 briefly reviews the model of Evans & Karras (1996) which shows how to evaluate the convergence hypothesis with panel data. In Section 3, we document the theory of panel unit roots. Empirical results are commented in section 4, for absolute convergence and Section 5 for conditional convergence. Section 6 concludes.

2- INCOME CONVERGENCE HYPOTHESIS AND PANEL UNIT ROOT TESTS

In the empirical convergence debate, two definitions have emerged : the absolute convergence and the conditional convergence. The former occurs when the level of per capita income of the poor countries catch-up the one of the rich ones. This can be achieved if the growth rates of developing countries are significantly higher than those of developed countries. The latter implies that each country is converging to its own steady state and that in the long run all the growth rates will be equalized.

Since the work of Barro & Sala-i-Martin (1991), the classical approach to convergence (or conditional β-convergence) has consisted in fitting cross-country regressions relating the average growth rate of per capita income over some time period to initial per capital income and country characteristics. The convergence hypothesis is said to occur if a negative correlation is found between the average growth rate and the initial income.

Quah (1993) criticizes cross-country growth regression on the basis of Galton's fallacy and shows that in order to evaluate the convergence hypothesis one must exploit the time series properties of the cross-country variances. Furthermore, Quah (1996) shows that the traditional result of a speed of convergence at a rate of 2% per year is a statistical illusion and comes from a small sample downward bias in unit root processes. He reveals that one can obtain such a result by applying the convergence classical approach to cross-sectional independent random walks. Bernard & Durlauf (1996) demonstrate that the cross section growth regressions cannot discriminate between the hypotheses of global or local convergence.

Finally, Evans (1996) proves that the classical approach is indeed valid under highly incredible conditions never satisfied by the available data[†]. So, he suggests exploiting both the time series and the cross section information included in the data of the per capita income in order to evaluate the convergence hypothesis. Then, the panel unit root approach of convergence consists of a unit root test in a panel of countries (Bernard & Jones, 1996).

Evans & Karras (1996) develop a formal test of the convergence hypothesis with panel unit root tools. Consider a sample of economies *1,2,...,N* that have access to the same body of technological knowledge. For each economy, the convergence hypothesis implies that a unique balanced growth path exists, that any deviation of the state variables from their long run values are temporary, and hence that initial values of the state variables have no long run effects on their level. The common technical knowledge assumption further implies that the balanced growth paths of the N economies are parallel. Therefore, the state variables can differ only by constant amounts. Conversely, the *N* economies diverge if the deviations from the steady state are permanent, and hence the initial values affect in the long run their levels.

In a stochastic world, economies 1,2,...,*N* are said to converge if, and only, if a common trend, a_t, and finite parameters $\mu_1, \mu_2, \cdots, \mu_N$ exist such that (Evans & Karras, 1996) :

$$(1) \qquad \lim_{i \to \infty} E_t\left(y_{n,t+i} - a_{t+i}\right) = \mu_n \quad \textit{for } n = 1,2,...,N.$$

where $y_{n,t}$ is the per capita income of country *n* during period *t.*

a_t is the common trend followed by the economies.

μ_n is a constant.

The parameter μ_n determines the level of economy *n*'s parallel growth path. Only in the very particular case where all the economies have identical structure will this parameter be zero, and hence all the economies will converge to the same growth path.

As the common trend is unobservable, equation (1) is not useful as it stands. Nevertheless, under the convergence hypothesis, one can obtain an estimator of its value. Indeed, if the

[†] The following conditions are necessary and sufficient for valid inference : the dynamical structures of the economies must have the same first-order autoregressive representation ; economies affect each other completely symmetrically ; and the vector of explanatory variables control for all permanent cross-economy differences.

deviations from the steady state are not permanent, then the cross-economy average of the per capita income must converge to the level of the common trend :

$$(2) \qquad \lim_{i\to\infty} E_t\left(\bar{y}_{t+i} - a_{t+i}\right) = 0 \text{ where } \bar{y}_t = \frac{1}{N}\sum_{n=1}^{N} y_{n,t} \ .$$

So, the convergence hypothesis implies the following condition (Evans & Karras, 1996) :

$$(3) \qquad \lim_{i\to\infty} E_t\left(y_{n,t+i} - \bar{y}_{t+i}\right) = \mu_n$$

According to this assumption, the deviations of $y_{1,t+i}, y_{2,t+i}, \cdots, y_{N,t+i}$ from their cross-economy average $\bar{y}_t$ can be expected, conditional on current information to approach constant values as *i* approach infinity. However, equation (3) holds if, and only, if $\left(y_{n,t} - \bar{y}_t\right)$ are stationary with an unconditional mean vector μ_n.

The convergence condition derived by Evans & Karras (1996) is easily derived if one postulates that each individual per capita income can be represented by the following dynamic process:

$$(4) \qquad y_{n,t} = \phi_n + \rho y_{n,t-1} + \varepsilon_{n,t}$$

where $\varepsilon_{n,t} \to i.i.d \ \ N\left(0, \sigma_\varepsilon^2\right)$ and ϕ_n is a constant value

Per capita incomes are stationary if $|\rho| < 1$. If this condition holds, then recursive backward resolution of equation (4) gives:

$$(5) \qquad y_{n,t} = \frac{\phi_n}{1-\rho} + \sum_{i=0}^{\infty} \rho^i \varepsilon_{n,t-i}$$

The long term equilibrium per capita income level corresponds to: $E(y_{n,t}) = \frac{\phi_n}{1-\rho}$. According to Evans & Karra's definition of the common trend, an estimator of this one can be computed by:

$$(6) \qquad E(\bar{y}_{n,t} - a_t) = 0 \Leftrightarrow E(a_t) = \frac{\bar{\phi}}{1-\rho}$$

$$\text{where } \bar{\phi} = \frac{1}{N}\sum_{i=1}^{N} \phi_n$$

Finally, Evans & Karras' convergence model can be rewrite as :

$$(7) \qquad E(y_{n,t} - a_t) = \mu_n$$

$$\text{where } \mu_n = \frac{\phi_n - \bar{\phi}}{1-\rho}$$

All countries converge to the same long run equilibrium level if $\phi_n = \phi = \bar{\phi}$ for all *n*. Hence, the convergence will be said absolute if $\mu_n = 0$ for all *n*. In turn, this implies that the poorer economies have exhibited a much higher growth rate than the richer ones, and hence that a catching-up is occurring. If $\mu_n \neq 0$ for some *n*, the convergence will be called conditional as each economy will converge to its own parallel growth path. This implies that only the growth rates will be equalize in the long run (cf. Figure I where we represent the balance growth path of three countries).

To conclude, the income converge hypothesis can be tested with a unit root test in panel data. Absolute convergence is tested if the panel unit root test does allow for some individual fixed effects. Conditional convergence is tested by applying panel unit root test with individual fixed effects. In the next section, we expose the theory of panel unit root test, and in the two following we apply them to the convergence issue in Middle East and North Africa.

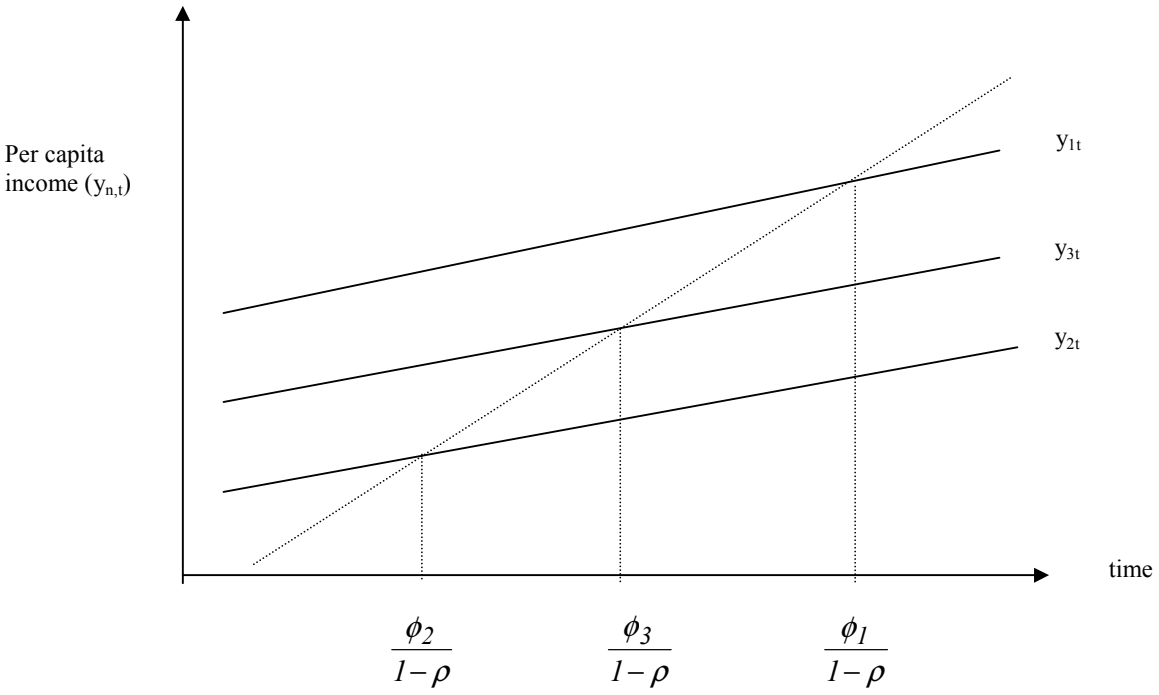


Fig. 1 : Convergence to a balance growth path for a three-country sample

3- PANEL UNIT ROOT TESTS: THEORY

In this section, we introduce the model that underlies testing for unit roots in panel data, and briefly review some existing approaches[‡] advanced by Quah(1994), Levin and Lin (1992) and Im, Pesaran & Shin (1996).

3.1- Quah's panel unit root

Quah (1994) considers the following simple dynamic unvaried panel:

$$(4) \qquad x_{it} = \rho x_{it-1} + u_{it} \qquad i = 1, \cdots, N \ et \ t = 1, \cdots, T$$

where u_{it} are independently and identically distributed both across i and t with finite variance, σ^2. Quah tests the following null hypothesis $H_0 : \rho = 1$ against the

[‡] See Maddala & Kim (1998) for a more comprehensive review of panel unit root tests.

alternative $H_1: \rho < 1$. Under additional conditions that $T = kN$ with $k > 0$, and $c = Lim_{T\to\infty} E\left(y_{i0} . T^{-1/2} \sum_{t=1}^{T} u_{it} \right)$ is the same for all *i*, Quah shows that under the unit root hypothesis, $H_0: \rho = 1$, as $N \to \infty$ and $T \to \infty$,

$$(5) \qquad Q_{NT}(c, \sigma^2) = \sqrt{\frac{N}{2}} T \left(\hat{\rho}_{NT} - 1 - 2 \frac{c}{\sigma^2} T^{-3/2} \right) \to N[0,1]$$

$$(6) \qquad t_{\hat{\rho}} \to N[0,1]$$

where $\hat{\rho}_{NT}$ is the pooled OLS estimator of ρ in (4), and $t_{\hat{\rho}}$ is the *t*-statistic of this estimator. $Q_{NT}\left(c, \sigma^2\right)$ is of limited practical use as it does not allow for the group specific effects and serially and heterogeneous errors. This statistic involves unobservable terms, which have to be estimated for this statistic to be operational. This problem explains why we have chosen in the empirical section to use the *t*-statistic.

Furthermore, as acknowledged by Quah (1994), it may be difficult to allow for fixed individual effects in his approach. Anyway, as the Evans & Karras's model have shown, it is possible to use the Quah's panel unit root to test the absolute convergence hypothesis.

3.2- The modified Levin & Lin's panel unit root

Levin & Lin (1992) provide a more general testing framework for panel unit root by allowing for individual fixed effects, common effects as well as different dynamics across different groups in u_{it} .

Levin & Lin's basic findings are twofold: (1) that as both *N* and *T* go to infinity, the limiting distribution of the unit root estimator is centered and normal as Quah (1994) have demonstrated it, and (2) that the panel setting permits relatively large power improvements. They consider the following dynamical model:

$$(7) \qquad x_{it} = \mu_i + \rho x_{it-1} + u_{it} \qquad i = 1, \cdots, N \ et \ t = 1, \cdots, T$$

where the $u_{it} \to i.i.d.\left(0,\sigma_u^2\right)$, $\mu_i \to i.i.d.\left(\bar{\mu},\sigma_\mu^2\right)$ and $E\left[\mu_i u_{it}\right]=0$. Let $\hat{\rho}_{NT}$ and $t_{\hat{\rho}}$ be the OLS parameter estimate and *t*-statistic from a regression of x_{it} on x_{it-1} including country specific intercepts. Under additional conditions that $\bar{\mu}=0$ and $\sigma_\mu^2=0$ (i.e. the unit process have no drift) and if *N* and *T* go to infinity with $\sqrt{N}/T$ going to zero, Levin & Lin (1992) show that under the unit root hypothesis, $H_0:\rho=1$:

$$(8) \qquad T\sqrt{N}(\hat{\rho}_{NT}-1)+3\sqrt{N} \to N(0,10.2)$$

$$(9) \qquad \sqrt{1.25}\,t_{\hat{\rho}}+\sqrt{1.875.N} \to N(0,1)$$

Furthermore, these results holds when a common time trend is included in the regression.

The Levin & Lin (1992) results provide asymptotic normality for the panel unit root tests in some common settings. One setting not considered in that paper is the case in which the data generating process is a unit root with nonzero drifts but time trends are omitted from the regression specification (Bernard & Jones, 1996).

However, as Evans & Karras have shown if there is conditional convergence, then the state variables can differ only by constant amounts. Therefore, the panel unit root test must include a drift term. Bernard & Jones (1996) extend the Levin & Lin test to allow for a unit root with nonzero drifts. Consider the regression model in equation (7), under the null hypothesis of a unit root with nonzero drifts ($\sigma_\mu^2 \neq 0$), they prove:

$$(10) \qquad T\sqrt{N}\left(\hat{\rho}_{NT}-1\right) \to N\left[0,12.\frac{\sigma_u^2}{\sigma_\mu^2+\bar{\mu}}\right]$$

$$(11) \qquad t_{\hat{\rho}} \to N[0,1]$$

The asymptotic normality of $\hat{\rho}_{NT}$ occurs as *T* goes to infinity because the results are driven by the time trends in x_{it}, in contrast, the normality in the Levin & Lin result is driven by the averaging across *N* non-normal distributions.

3.3- Im, Pesaran, & Shin's heterogeneous panel unit root test

The major limitation of the modified Levin & Lin test is that ρ is the same for all observations. Thus, if we denoted by ρ_i the value of ρ for the i-th cross section unit then the Levin & Lin test specifies the null H_0 and alternative H_1 as:

(12) $H_0: \rho_1 = \rho_2 = \cdots = \rho_N = \rho = 1$

(13) $H_1: \rho_1 = \rho_2 = \cdots = \rho_N = \rho < 1$

According to Maddala & Wu (1996), in testing the convergence hypothesis in growth models, one can formulate the null as implying that none of the economies under study converges and thus $\rho = 1$ for all economies. But it does not make any sense to assume that all the countries will converge at the same rate if they do converge.

Im, Pesaran & Shin (IPS, 1996) relax the assumption that $\rho_1 = \rho_2 = \cdots = \rho_N = \rho$ under the alternative. The basic idea of the test is very simple. Instead of pooling the data, we use separate unit root tests for the *N* cross-section units.

Consider the *t*-test for each cross-section unit based on *T* observations. Let t_i $(i = 1,2,\cdots,N)$ denote the *t*-statistics for testing unit roots, and let $E(t_i) = \mu$ and $V(t_i) = \sigma^2$. Under the additional conditions that *N* and *T* go to infinity with $\sqrt{N}/T$ going to zero, they prove:

(14) $$\Gamma_{\bar{t}} = \frac{\sqrt{N}(\bar{t} - \mu)}{\sigma} \rightarrow N(0,1) \text{ where } \bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_i$$

The problem is computing μ and σ^2. This they do by Monte Carlo simulations and tabulate them for ready reference (Table A,B of their paper). In the case where the disturbances in the underlying DF regressions are serially correlated, IPS considers ADF regressions. The modified version of the regression is given by:

(15) $$x_{it} = \rho_i x_{it-1} + (1 - \rho_i)\mu_i + \sum_{i=1}^{p_i} \gamma_{ij} \Delta x_{i,t-j} + \varepsilon_{it}, \; i = 1,\cdots,N \; et \; t = 1,\cdots,T$$

where $\varepsilon_{it} \rightarrow i.i.d.N\left(0,\sigma_i^2\right)$

The parameters disturbances depend on time trend included in the regressions and autoregressive coefficients (i.e. p_i et $\hat{\gamma}_i$). IPS proposes the following statistic:

$$\Psi_{\bar{t}} = \frac{\sqrt{N}\left[\frac{1}{N}\sum_{i=1}^{N} t_{iT}(p_i,\hat{\gamma}_i) - \frac{1}{N}\sum_{i=1}^{N} E\left[t_{iT}(p_i,0)\right]\right]}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} Var\left[t_{iT}(p_i,0)\right]}} \quad (16)$$

$E\left[t_{iT}(p_i,0)\right]$ and $Var\left[t_{iT}(p_i,0)\right]$ have been evaluated via stochastic simulations considering the time trend.

In the next two sections we will apply these panel unit root tests to the convergence issue by first testing the absolute convergence hypothesis and second testing for the conditional convergence hypothesis.

4- TESTING THE CATCHING-UP HYPOTHESIS IN MIDDLE EAST AND NORTH AFRICA

4.1- The Data

First we use 5.2 Summers Heston (1995)'s dataset of annual per capita income for eleven MENA countries from 1960 to 1990: Algeria, Egypt, Morocco, Iran, Iraq, Israel, Jordan, Saudi Arabia, Syria, Tunisia and Turkey. We check if there are some (exogenous) convergent clubs in Middle East and North Africa by analyzing some groups of MENA countries. Country groups are shaped by tag to geographical region and nature of the economy (diversified or based on the export of oil allowances) criteria. MENA includes all the eleven countries, Maghreb-1 consists of Algeria, Morocco and Tunisia, Maghreb-2 includes Maghreb-1 countries plus Egypt, Middle East-1 consists of countries from the Middle East geographic region (Egypt, Iran, Iraq, Jordan, Israel, Saudi Arabia, Syria, and Turkey), Middle East-2 includes Middle East-1 group countries menus Egypt, Middle East-3 includes Middle East-1 group countries minus Israel, Middle East-4 is Middle East-1 menus Egypt and Israel,

Middle East-5 is Middle East-1 menus Egypt, Israel and Saudi Arabia, Middle East-6 is a group formed by four countries: Egypt, Jordan, Syria and Turkey, Middle East-7 is the Middle East-6 group menus Turkey, Oil countries-1 consists of Algeria, Iran, Iraq and Saudi Arabia, Oil countries-2 includes Oil countries-1 group minus Saudi Arabia, Oil countries-3 regroups Algeria, Iran and Egypt, Non-oil countries-1 consists of Egypt, Morocco, Tunisia, Israel, Jordan, Syria, and Turkey, Non-oil countries-2 includes Non-oil countries-1 group menus Israel, Non-oil countries-3 includes Non-oil countries-1 group minus Israel and Egypt, Non-oil countries-4 is formed by Non-oil countries from the Middle East geographic region minus Israel and Egypt (Jordan, Syria and Turkey), Non-oil countries-5 consists of Non-oil countries from the Maghreb geographic region plus Egypt (Morocco, Tunisia and Egypt), Non-oil countries-6 is composed by Tunisia, Morocco and Jordan, Non-oil countries-7 includes Non-oil countries-6 plus Turkey.

In a second exercise of the panel unit root tests technique to the convergence issue, we use the 6.1 version of Summers Heston (2002)'s data set of annual per capita income for nine MENA countries from 1960 to 2000: Algeria, Egypt, Morocco, Iran, Israel, Jordan, Syria, Tunisia and Turkey. Iraq's and Saudi Arabia's data are non available in the new data set. We try as possible as we can to have the same groups composition as those of the first used dataset, in purpose to be able to compare the exercises results.
This step enabled us to select the 20 groups of following countries:

- MENA gathers the 11 countries of the sample.
- The Maghreb-1 is composed of Algeria, Morocco and Tunisia.
- The Maghreb-2 comprises the countries of the Maghreb-1 plus Egypt.
- Middle East-1 is the group of the countries of the sample which belong to the geographical area of the Middle East: it acts of Egypt, Iran, Iraq, Jordan, Israel, Saudi Arabia, Syria and Turkey.
- Middle East-2 is not other than the group Middle East-1, without Egypt.
- Middle East-3 is Middle East-1, without Israel.
- Middle East-4 is composed of the countries of Middle East-1, without Egypt and Israel.
- Middle East-5 is Middle East-1, without Egypt, Israel and Saudi Arabia.
- Middle East-6 gathers 4 countries: Egypt, Jordan, Syria and Turkey.

- Middle East-7 comprises 3 countries: Egypt, Jordan and Syria. It is the group Middle East-6 minus Turkey.
- Oil countries-1 is the whole of the oil countries of the sample: Algeria, Iran, Iraq and Saudi Arabia.
- Oil countries-2 excluded Saudi Arabia from Oil countries-1.
- Oil countries-3 gathers Algeria, Iran and Egypt.
- Not-oil countries-1 is composed of all the non oil countries of the sample: Egypt, Morocco, Tunisia, Israel, Jordan, Syria and Turkey.
- Not-oil countries-2 is not other than Not-oil countries-1, without Israel.
- Not-oil countries-3 includes Not-oil countries-1, without Israel and Egypt.
- Not-oil countries-4 gathers the non oil countries belonging to the geographical area of the Middle East, without Israel and Egypt: Jordan, Syria and Turkey.
- Not-oil countries-5 is composed of the non oil countries of the Maghreb, plus Egypt: Morocco, Tunisia and Egypt.
- Not-oil countries-6 comprises Tunisia, Morocco and Jordan.
- Not-oil countries-7 integrates Turkey into the group of country Not-oil countries-6.

In another study, we use the same econometric technique for the search for clubs of convergence within our sample, but this time during one longer period going from 1960 to 2000. This is made possible thanks to version 6.1 of the data of Summers and Heston (1991). However, the data of annual income per capita, relating to Saudi Arabia and Iraq, are not availaible any more in this new version. Thus, our sample will be made up only of 9 Middle East and Maghreb countries: Algeria, Egypt, Morocco, Iran, Israel, Jordan, Syria, Tunisia and Turkey. We test within the limit of possible to recompose the same groups of country as during the first period, in order to then be able to compare the results. However, groups made up of 3 or 4 countries whose Iraq and/or Saudi Arabia were eliminated, since with only 2 countries, the application of the unit test of root is not relevant any more. It is the case of the groups Oil countries-1 and Oil countries-2. In the same way, by excluding Iraq and Saudi Arabia, the groups Middle East-4 and Middle East-5 become equivalent. This leads us to one to select 17 groups instead of the 20 envisaged.

4.2- Economic overview

The MENA region enjoys abundant human and natural resources specially crude-oil production. One quarter of the world's known crude-oil reserves are located in Saudi Arabia. The Islamic Republic of Iran has 15 percent of the world's total of natural gas reserves. The region also possesses other mineral and non-mineral resources. Algeria, Morocco, Tunisia, Jordan, and the Syrian account for about one third of the world's phosphate production, and Morocco itself has more than 30 percent of the world's phosphate rock and 40 percent of its phosphoric acid trade. Iran, Israel, and Jordan have potash. Egypt, Syria, and Iran have respectively cotton, tobacco, iron, coal and ammonia. In addition, almost all country groups have coasts and fishing grounds.

Within this general characterization country vary substantially in resources, economic and geographical size, and population. Intra-regional interaction is weak, being restricted principally to labor flows with limited trade in goods and services. The rate of unemployment exceeds those of most other regions in the world. Traditional indicators of human resource development in the region, such as average life expectancy at birth, infant mortality rate, and primary and secondary school enrolment as a percentage of school age population fairly satisfactory, above those of developing countries with comparable per capita income. Although the average illiteracy rate in the region is high. Education and illiteracy are more unfavorable for women than for men.

On the external side the MENA region appear very open, but it trades mainly with industrial economies. The countries of the EU are the most important trading partners. Intra-regional trade plays a limited role in integrating the MENA countries, but the region experiences large intra-regional labor movements, which have been the main vehicle of the region's economic integration, triggering substantial financial flows in the form of worker's remittances and transmitting economic impulses across countries. Hanes, labor markets in the MENA region remain highly integrated relative to other region in the world. Remittances amount about one quarter of exports of goods and services of non-oil countries and exceed 50% in Egypt, and Jordan. In addition to their balance of payments impact, labor remittances account for much of private investment in certain countries in the region like Jordan. Many Arab workers, especially from North Africa, have also migrated outside the MENA region, mainly to Europe, because of special historical relations with this countries, and home employment

conditions. The region has received inflows of migrant workers in Saudi Arabia and Israel from outside the region, especially South and East Asia.

The challenges for the MENA region

MENA countries have to face the same challenges of improving productive and a locative sufficiency by reducing bureaucratic ineffectiveness, red tape, corruption, excessive government intrusion and by improving the deplorable state of service delivery that has characterized the region for quite some time.

Most of these challenges remain difficult to meet in MENA countries because of the outdated regulations. The future of the MENA economies still linked to their ability to cooperate and how their governments, businesspersons, investors, workers, and communities generally, respond together to these challenges. MENA countries are still in need of a common sense in purpose and a shared vision to improve their productivity competitiveness, institutions and overall standards of living.

A speed changes in the international economic environment, with the liberalization of trade, along the lines of the agreements of the World Trade Organization (WTO) and the increasing dominance of the multinational corporations (TNC). Regional trading blocs dominated by the United States, Japan and the European Union, are consolidating their markets and marginalizing countries outside these blocs. In particular, the Euro-Med partnership is putting more and more pressure on the trade policies of MENA countries.

The faster rate of technological change, which becomes a critical factor is in the competitiveness of nation and enterprises. Technological innovations have changed the traditional base of economic success, with a radical decline in the resource intensities of product, and with software and human attributes replacing this in improving efficiency and achieving competitive advantage.

Many MENA countries, especially Arab countries have embarked on programs for restructuring their industrial sector and are reviewing their industrial policies and strategies. But despite these efforts the sector remains inadequately prepared to meet the new challenges,

the trade liberalization and the technological innovations. Yet the impact of such programs is still limited, particularly more recently, after September eleventh events and with the negative turn of peace process. The region returns to some kind of political instability and the uncertainty and unpredictable nature of the circumstances. Countries still undergoing the transition from a centralized to a more open economy, with a larger role allocated to the private sector in the economic activities of the region.

Bilateral and multilateral agreements have also seen progress in the region enhancing economic and industrial cooperation. We note a strengthening in the sub region Gulf Cooperation Council (GCC), and a more serious attention from the Arab countries to develop a Pan Arab Economic Bloc, translated into a timetable for the implementation of the Arab Free Trade Agreement (AFTA), which started in January 1998 and is expecting to be completed within ten years.

Considerable empirical evidence shows that the potential for "catching-up" is only realized by countries having a strong "social capability" that manage and mobilize investment, education, R&D, etc.

4.3- Empirical results of the catching-up test.

Recently, Ben-David (1993) presents the following model in order to test the existence of a catching-up inside a N countries group:

$$(15) \qquad \left(y_{n,t} - \bar{y}_t\right) = \phi\left(y_{n,t-1} - \bar{y}_{t-1}\right) + \varepsilon_{it} \qquad n = 1,\ldots,N \quad \text{et} \quad t = 1,\cdots,T$$

The catching-up hypothesis ($\phi < 1$) is then a unit root test on panel data. We test the assumption that the N countries are converging to the average cross-economy per capita income. As we use centered per capita income, this gives us the possibility not to include a constant term in the regression, and then we can directly apply Quah's results (Ben-David, 1996).

As serial correlation is possible, Ben-David does not estimate equation (15), but an ADF type regression. The optimal lag length (l) has been selected by the Akaike AIC criteria. The Ben-

David standard approach is extended by calculating the critical values of the different unit root tests by Monte-Carlo simulations. Indeed, Quah (1994)'s results are valid only asymptotically. So, when the country sample sizes are small, the use of normal distribution can lead to spurious results.

The critical values are calculated by Monte-Carlo simulation as follows: First, for each country group studied, we differ the data and estimate the variance, σ^2. Next, we generate an $(N \times T)$ panel of simulated random walks by drawing from an $N(0, \sigma^2)$. Third, we run the panel unit root test on this simulated data. Finally, we repeat this experiment 10000 times and then calculate the critical values of the *t*-statistic.

Results are reported in Table 1. The whole country sample is characterized by an income convergence within the countries ($\phi \prec 1$). We reject the null hypothesis of a unit root in this panel of countries at the 5% level. We check now if there are some convergence clubs by studying different sampling countries.

4.3.1- Empirical results of the catching-up test for the period 1960-1990.

The conclusion of stability in the panel stays valid for more homogeneous countries groups in terms of economic development. Indeed, either for Maghre-1, Maghreb-2, Middle East-1, Middle East-2, Middle East-3, Non-Oil countries-1, Non-Oil countries-2, Non-Oil countries-3 or even Non-Oil countries-4, the estimated value of the autoregressive coefficient is inferior to one: the economic integration level of these countries may be enough for an income convergence trend to appear. The catching-up assumption is accepted at 1% for Maghre-1, Maghreb-2, Middle East-1, Non-Oil countries-2, Non-Oil countries-3 and Non-Oil countries-4, at 5% for Middle East-2, Middle East-3, and Non-Oil countries-1 and finally at 10% for Middle East-5. The behavior of Middle East-4, Oil countries-1, Oil countries-2, Oil countries-3, Non-Oil countries-5, Non-Oil countries-6 and Non-Oil countries-7 are quite different from those of the other country groups of the region. The estimated coefficients for these five country groups are less than one, which can imply a possible convergence movement between countries of the same group. However, even at the 10% level, the unit root hypothesis is accepted and then the catching-up assumption is rejected between countries of hitch group.

The following table resumes the section results:

MENA: Algeria, Egypt, Morocco, Tunisia, Iran, Iraq Israel, Jordan, Saudi Arabia, Syria and Turkey	Convergence at 1%
Maghre-1: Algeria, Morocco and Tunisia	Convergence at 1%
Maghre-2: Algeria, Morocco, Tunisia and Egypt	Convergence at 1%
Middle East-1: Egypt, Iran, Iraq, Israel, Jordan, Saudi Arabia, Syria and Turkey	Convergence at 5%
Middle East-2: Iran, Iraq, Israel, Jordan, Saudi Arabia, Syria and Turkey	Convergence at 1%
Middle East-3: Egypt, Iran, Iraq, Jordan, Saudi Arabia, Syria and Turkey	Convergence at 5%
Middle East-4: Iran, Iraq, Jordan, Saudi Arabia, Syria and Turkey	Convergence at 5%
Middle East-5: Iran, Iraq, Jordan, Syria and Turkey	Convergence at 5%
Middle East-6: Egypt, Jordan, Syria and Turkey	Divergence
Middle East-7: Egypt, Jordan and Syria	Convergence at10%
Oil countries-1: Algeria, Iran, Iraq and Saudi Arabia	Divergence
Oil countries-2: Algeria, Iran and Iraq	Divergence
Oil countries-3: Algeria, Iran and Egypt	Divergence
Non-Oil countries-1: Egypt, Morocco, Tunisia, Israel, Jordan, Syria and Turkey	Convergence at 5%
Non-Oil countries-2: Egypt, Morocco, Tunisia, Jordan, Syria and Turkey	Convergence at 1%
Non-Oil countries-3: Morocco, Tunisia, Jordan, Syria and Turkey	Convergence at 1%
Non-Oil countries-4: Jordan, Syria and Turkey	Convergence at 1%
Non-Oil countries-5: Egypt, Morocco and Tunisia	Divergence
Non-Oil countries-6: Morocco, Tunisia and Jordan	Convergence at 10%
Non-Oil countries-7: Morocco, Tunisia, Jordan and Turkey	Convergence at 5%

The considered country pool (MENA) is convergent which proves a certain harmony despite economic and financial diversity among countries. This result can be explained by the fact that countries of the region are confronting the same policy challenges: intensifying

privatization and deregulation, reforming public finance, improving the functioning of labor markets, strengthening human resources, enhancing domestic and foreign investments, and liberalizing external trade and payments.

The countries share similar structural economic characteristics that have influenced their economic performance. In particular four structural aspects stand out:

- A poor diversified economic and export base at individual country level:

While the whole region's economy is relatively diversified, most countries have a narrow economic base? In many countries the economy is dominated by a single sector, and so by a single product, which constitutes most domestic output, such as oil. In almost all oil-exporting countries, oil account for over 50% of GDP. Manufacturing is diversified only In Israel, Morocco, Tunisia, and Turkey. Tourism is an important output component in Egypt, Israel, Morocco, Tunisia, and Turkey.

- Vulnerability to exogenous shocks:

The narrow production and export bases make group economies vulnerable to exogenous shocks. The fluctuation in the international price oil, have a direct impact on export receipts and government revenues in oil-exporting countries. It also has important consequences for the other countries in the region, which are dependant on transfers from workers in oil-countries. The primary commodities-exporting countries are affected by the fluctuation in international prices. Many countries of the region are vulnerable to fluctuations in prices of foodstuffs, since they are importers. In some countries, such as Morocco and Tunisia, economic performance remains vulnerable to agricultural output which depends heavily on weather conditions (drought).

- Limited integration into international capital markets:

Capital flows into the region have been small, because of a very little access to capital markets of industrial countries. Foreign direct investment (FDI) in the region has been lower than in other developing countries in Asia and Latin America, except sub-Saharan Africa. The region-limited access to the international market is also caused by the primary development stage of the home capital markets of the regions countries. Furthermore private capital inflows have shown more diversity and response in countries that have made steady progress in

macroeconomic and structural adjustment, such as Egypt, Israel, Jordan, Morocco, and Tunisia.

- Public sector dominance of economic activity:

Domestic output is dominated by public sector in most countries of the group. The public sector accounts for 30 to 60 percent of the labor force in most countries. Public enterprises have weak performance because of very low competition, organizational and managerial shortcomings, administrative controls, inappropriate pricing policies, and over employment. Consequently, public sector depends heavily on government transfers and subsidies, which create more problems to fiscal and monetary policies. In addition, dominance of public sector employment and recruitment, job security, and wage setting practices participate to lows productivity in most countries

If we use geographic criteria to select countries groups the result are quite surprising. All the groups are convergent (MENA, Maghreb-1, Maghreb-2, Middle East-1 and Middle East-2). Groups chosen with a reference to economic structures essentially oil and non oil countries, chow an evidence of oil countries divergence (Oil countries-1, Non-Oil countries-1). Joint to a little group of countries Egypt causes frequently a divergence. Until 1990 Egypt seems to converge to lowest GDP per capita compared to the other countries. In fact, Non-Oil countries-4 group (Jordan, Syria and Turkey) is convergent at 1%, but if we add Egypt, Middle East-6 (Egypt, Jordan, Syria and Turkey), the group becomes divergent, without Turkey the Middle East-7 group (Egypt, Jordan and Syria) is convergent at 10%. Or the mean of GDP per capita is the higher for Jordan, Syria and Turkey. The same conclusion results from the convergence of Maghreb-2 group (Algeria, Morocco, Tunisia and Egypt) with a lower mean of GDP per capita than Non-OIL countries-5 (Egypt, Morocco and Tunisia), which is divergent.

Table n° 1: Quah's panel unit root

Groups	N.T	$\hat{\phi}$	$t_{\hat{\phi}}$	*l*	Critical Values		
					1 %	*5%*	*10 %*
MENA	341	0.9681	-2.3422	0	-2.477	-1.763	-1.400
Maghreb-1	93	0.8860	-2.7993	0	-2.642	-1.882	-1.541
Maghreb-2	124	0.9158	-2.6579	0	-2.539	-1.866	-1.492
Middle East-1	248	0.9605	-2.1620	0	-2.500	-1.782	-1.411
Middle East-2	217	0.9381	-2.6255	0	-2.466	-1.771	-1.391
Middle East-3	217	0.9686	-1.8167	0	-2.484	-1.782	-1.436
Middle East-4	186	0.9550	-2.0820	0	-2.497	-1.812	-1.416
Middle East-5	155	0.9379	-2.3092	0	-2.543	-1.846	-1.454
Middle East-6	124	0.9673	-1.2699	0	-2.487	-1.798	-1.454
Middle East-7	93	0.9732	-1.5578	0	-2.610	-1.914	-1.530
Oil Countries-1	124	0.9818	-1.0125	0	-2.552	-1.821	-1.465
Oil Countries-2	93	0.9652	-1.4247	0	-2.521	-1.870	-1.512
Oil Countries-3	93	0.9644	-1.2843	0	-2.501	-1.865	-1.517
Non Oil Countries-1	217	0.9653	-2.0161	0	-2.448	-1.801	-1.426
Non Oil Countries-2	186	0,7578	-3,3744	1	-2,546	-1,805	-1,417
Non Oil Countries-3	155	0 ,7269	-3,5347	1	-2,564	-1,822	-1 ,449
Non Oil Countries-4	93	0,8534	-2,7984	0	-2,552	-1,872	-1,521
Non Oil Countries-5	93	0,9703	-0,9913	0	-2,593	-1,887	-1,505
Non Oil Countries-6	93	0,9406	-1,7627	0	-2,537	-1,837	-1,483
Non Oil Countries-7	124	0,9512	-1,8260	0	-2,526	-1,825	-1,454

4.3.2 Empirical results of the catching-up test for the period 1960-2000

The availability of the data until 2000 enables us to extend the range of our study and to highlight the effects of the war of the Gulf (1991) on the convergence of the countries of the area. The results obtained are comparable with those of the period 1960 to 1990.

As for the preceding study, the estimated autoregressive coefficient of all the groups considered is lower than 1. One thus expects a tendency of convergence of the real incomes per capita of the countries of each group. Indeed, the assumption of catching-up is accepted for the majority of the groups and especially for the group made up of all the countries of the sample. Thus, absolute convergence is checked for MENA (Algeria, Egypt, Morocco, Tunisia, Iran, Israel, Jordan, Syria and Turkey) at 5% level. The assumption of catching-up is also accepted at 1% for the Maghreb-1, Middle East-1 and Middle East-3, with the threshold of 5% for the Maghreb-2, Middle East-7, Not-Oil countries-1 and Not-Oil countries-2, and at 10% for Middle East-2, Middle East-4 and 5, Middle East-6. The catching-up is however

rejected for the groups Oil countries-3, Not-Oil countries-4, Not-Oil countries-5, Not-Oil countries-6 and Not-Oil countries-7.

Some important differences are however to announce. Thus, Egypt seems to converge towards a level of real GDP per capita higher, undoubtedly ascribable with the American assistance after the war of the Gulf (1991). Egypt could catch up with the level of income of the other countries, which underwent the harmful economic effects of the war, especially in the tourist sector. This results from the strongest convergence of Middle East-1 (Egypt, Iran, Iraq, Israel, Jordan, Saudi Arabia, Syria and Turkey) at 1% level compared to Middle East-2 converging only at 10%, this last group not being other than the first without Egypt. This group of country converged better (to 1%) without Egypt during the first period of 1960 to 1990 and with Egypt during the second period of study of 1960 to 2000. This result is confirmed by a faster catching-up between the countries of the Middle East-3 group (Egypt, Iran, Iraq, Jordan, Saudi Arabia, Syria and Turkey) to 1% during this study that during the first. On the contrary, Middle East-4, composed of the same countries, but without Egypt, sees its process of catching-up weakening. By comparing the results of convergence of the groups Middle East-6 (Egypt, Jordan, Syria and Turkey) and Middle East-7, the same conclusions are obtained. Middle East-7 is convergent at 5%, more homogeneous than Middle East-6, which integrates Turkey, of a level of development more raised, which only explains its convergence at 10%. Moreover, the group Middle East-6 was divergent over the period 1960 to 1990, whereas Middle East-7 converged with a weaker level, 10%.

In addition, the "mixed" groups composed of oil and non oil countries, Middle East-4 and Middle East-5, become divergent in this second study. This phenomenon is explained by the crisis of the tourism sector and the fall of the price of oil following the Gulf war of (1991), which caused a divergence between the countries with diversified economy where the tourism sector occupies a significant part and the exporting countries of hydrocarbons. In the final analysis, this last study shows a less convergence of the groups of country with Israel and/or Turkey, which reveals another consequence of the Gulf war, the tendency of these two countries to converge towards higher long term levels of incomes compared to the rest of countries.

MENA: Algeria, Egypt, Morocco, Tunisia, Iraq Israel, Jordan, Syria and Turkey	Convergence at 5%
Maghre-1: Algeria, Morocco and Tunisia	Convergence at 1%
Maghre-2: Algeria, Morocco, Tunisia and Egypt	Convergence at 5%
Middle East-1: Egypt, Iran, Israel, Jordan, Syria and Turkey	Convergence at 1%
Middle East-2: Iran, Israel, Jordan, Syria and Turkey	Convergence at 10%
Middle East-3: Egypt, Iran, Jordan, Syria and Turkey	Convergence at 1%
Middle East-4 and 5*: Iran, Jordan, Syria and Turkey	Convergence at 10%
Middle East-6: Egypt, Jordan, Syria and Turkey	Convergence at 10%
Middle East-7: Egypt, Jordan and Syria	Convergence at 5%
Oil countries-3: Algeria, Iran and Egypt	Divergence
Non-Oil countries-1: Egypt, Morocco, Tunisia, Israel, Jordan, Syria and Turkey	Convergence at 5%
Non-Oil countries-2: Egypt, Morocco, Tunisia, Jordan, Syria and Turkey	Convergence at 5%
Non-Oil countries-3: Morocco, Tunisia, Jordan, Syria and Turkey	Convergence at 10%
Non-Oil countries-4: Jordan, Syria and Turkey	Divergence
Non-Oil countries-5: Egypt, Morocco and Tunisia	Divergence
Non-Oil countries-6: Morocco, Tunisia and Jordan	Divergence
Non-Oil countries-7: Morocco, Tunisia, Jordan and Turkey	Divergence

Groups 4 and 5 became equivalent because of the taking out of Iraq and Saudi Arabia from the new Summers and Heston's (2002) data.

Table n° 1 : Quah's panel unit root

Groups	N.T	$\hat{\phi}$	$t_{\hat{\phi}}$	*l*	Critical Values		
					1 %	*5%*	*10 %*
MENA	369	0.9756	-2.1275	0	-2.405	-1.724	-1.361
Maghreb-1	123	0.9427	-2.9228	0	-2.532	-1.867	-1.494
Maghreb-2	164	0.9444	-2.3297	0	-2.542	-1.819	-1.467
Middle East-1	246	0.9734	-2.8745	0	-2.482	-1.779	-1.450
Middle East-2	205	0.9718	-1.7038	0	-2.471	-1.824	-1.472
Middle East-3	205	0.9630	-2.9442	0	-2.559	-1.828	-1.453
Middle East-4 and 5	164	0.9601	-1.7639	0	-2.496	-1.832	-1.454
Middle East-6	164	0.9621	-1.6755	0	-2.549	-1.853	-1.505
Middle East-7	123	0.9095	-2.4328	0	-2.537	-1.872	-1.517
Oil Countries-3	123	0.9716	-1.3230	0	-2.590	-1.844	-1.478
Non Oil Countries-1	287	0.9732	-1.9934	0	-2.455	-1.769	-1.413
Non Oil Countries-2	246	0.9670	-1.9232	1	-2.432	-1.795	-1.435
Non Oil Countries-3	205	0 .9660	-1.7797	1	-2.473	-1.802	-1 .443
Non Oil Countries-4	123	0.9618	-1.3877	0	-2,559	-1.860	-1.501
Non Oil Countries-5	123	0.9736	-1.0411	0	-2.627	-1.918	-1.534
Non Oil Countries-6	123	0.9625	-1.3003	0	-2.492	-1.878	-1.525
Non Oil Countries-7	164	0,9750	-1.3121	0	-2.551	-1.836	-1.467

This application of the Quah (1994) unit root test for the search of catching-up or absolute convergence makes it possible to conclude that the incomes in Middle East and North Africa area tend to converge. However, certain groups of country show a divergence. We try to check if this result is due to a rupture in the process of growth or a change of behaviour of these economies during the period of study. In the following sub-section, we study the possibility of arriving at other conclusions if we admit the presence of a rupture in the tests of unit root on data of panel.

4.4- Panel unit root with endogenous break

The conclusions drawn from Ben-David's approach of no catching-up in some groups have to be explained. This finding can arise for some countries in the Middle East and North Africa (MENA) region from a missing in the unit root test of a break occurred in the development strategy.

We will apply the same argument in the panel unit root approach of convergence as above. To our knowledge, there is no asymptotic theory for panel unit root test with endogenous break.

However, for empirical purpose, we can use the result that with panel data, all the test statistics converge to normal distributions.

Yet, as the time break is endogenous and is estimated with the same data as the panel unit root test, we can no longer use the critical values of a Chow (or Wald) test. Andrews (1993a) provides simulated critical values for different numbers of variables in the regression.

We calculate recursively the Wald statistic[§] for each year between 1963 and 1987 for the data of 1960 to 1990, and for each year between 1963 and 1997 for the data of 1960 to 2000, which correspond to a time sample split of 90%. This choice, although arbitrary, is the one recommended by Andrews.

4.4.1 Test of root unit with endogenous break during the period 1960 to 1990

Among the unit of the groups studied during this period, five results diverge; it acts of Middle East-6, Oil-countries-1, Oil-countries-2, Oil-countries-3, and Non oil-countries-5. This result can be explained with a rupture in the process of growth of the countries of these groups. the estimated coefficients of equation (15) are characterized by parameter instability. Thanks to asymptotic normality of the coefficients, one can check this assumption with a standard stability Chow test[**]. In Fig1a and 1b are reported both the value of the recursive Chow statistic for each year and the (real) critical value at the level of 5 and 10 %. We reject the null hypothesis of parameter stability at the 5% level for Oil Countries-1, Oil Countries-2 and Non-Oil Countries-5. The null of no break is only accepted at standard level for Middle East-6 and Oil Countries-3.

The results of the tests highlight dates of rupture at the end of the Seventies and the beginning of the Eighties. This period is characterized by a change in the strategy of development of the countries of the area. Indeed, it is at that time that the countries of MENA engaged of the policies of commercial opening and structural adjustment. We try to check that these ruptures

[§] The Wald statistics corresponds to q times the Chow statistics, where q is the number of estimated coefficients in the regression.

[**] This idea has been first described and implemented by Soete & Verspagen (1994) in Ben-David's approach. However, they have estimated the time break with the classical Chow critical values which can give spurious conclusions as Andrews (1993a) has demonstrated.

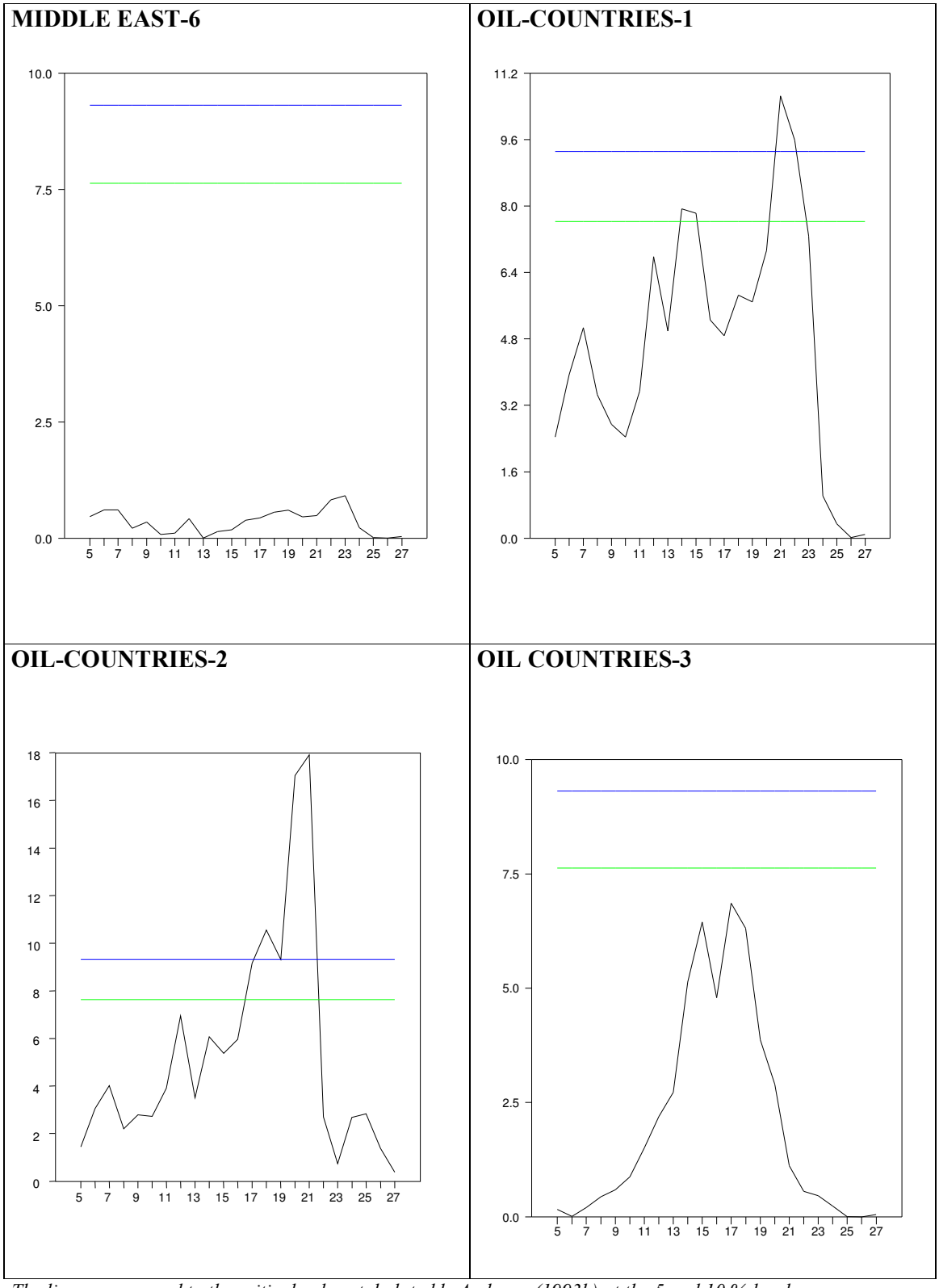
do not correspond to political crises in this area. We apply then, for each group, of the tests of unit root before and after the date of rupture, to evaluate the incidence of the international and regional opening of the trade, the economic reorganization and the exogenous shocks to the process of convergence of the levels of incomes of these countries.

The application of the tests to the Middle East-6 group (Egypt, Jordan, Syria and Turkey) gives results enough surprising. The date of rupture, estimated at 1982, is not significant, but the tests of unit root show that after this date, the countries of the group became more integrated. This date corresponds in addition to a political crisis between Syria and Jordan consecutive to a rising in a Syrian city aiming at the inversion of President Hafed El Assad, according to this last, militarily supported attempt, by the United States, Israel, Jordan, and the Christians Lebanese.

The same phenomenon is observed for Oil-countries-3 (Algeria, Iran and Egypt): the rupture in 1976 is not significant, but the tests show a convergence after 1976. This date is close to the second oil crisis of 1979 and very near to 1977, year of the revolution of food in Egypt, following a rising of prices of the foodstuffs of first need of more than 30%, which has constrained the Egyptian government to moderate its economic reforms. For the groups Oil-countries-1 (Algeria, Iran, Iraq and Saudi Arabia) and Oil-countries-2 (Algeria, Iran and Iraq), the date of estimated rupture is 1980. Before 1980, the null assumption of a unit root is accepted, while after 1980, it is rejected at 1 % level. Thus, each one of these two groups of country knew an absolute convergence towards the same level of real income per capita after 1980. 1980 is the year of the bursting of the war Iraq-Iranian war which will continue until 1988. However, Iraq and Iran form part of these two groups.

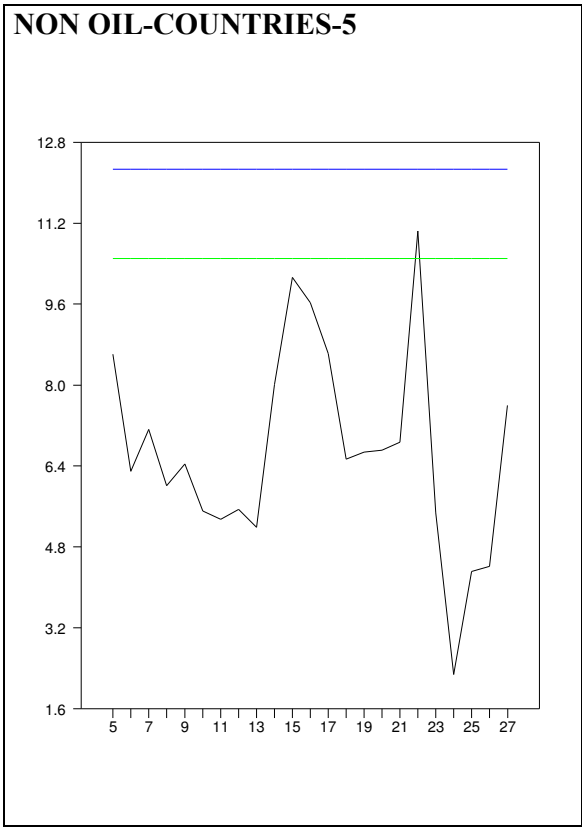
The date of rupture estimated for the group Non-Oil countries-5 (Egypt, Morocco and Tunisia) is 1981, and proves to be significant to 10%. However, the unit test of root reveals a divergence before and after this endogenous rupture. We notice that for the two under-periods, the coefficient ϕ is lower than 1. However, October 6, 1981, during a military procession Anouar El Sadat, the Egyptian president, is assassinated by members of its army.

Fig.1a : Recursive Wald tests



The lines correspond to the critical values tabulated byAndrews (1993b) at the 5 and 10 % level.

Fig.1b : Recursive Wald Tests



The lines correspond to the critical values tabulated byAndrews (1993b) at the 5 and 10 % level.

Table n° 2 : Quah's panel unit root with an endogenous break

Groups	TB	$\hat{\phi}_{t_1}$ (1)	l_1	l_2	ϕ_{t_2} (2)	Critical Valuess		
						1 %	*5%*	*10 %*
Middle East-6	1982	0.9894 (-0.4661)	0	0	0.9477* (-1.7508)	-2.487	-1.798	-1.454
Oil-countries-1	1980 ‡‡	1.0181 (1.1459)	0	2	0.9265*** (-3.0590)	-2.552	-1.821	-1.465
Oil-countries-2	1980 ‡‡	0.9960 (-0.1731)	0	2	0.7299*** (-5.8109)	-2.521	-1.870	-1.512
Oil Countries-3	1976	1.0100 (0.6233)	0	1	0.9564** (-2.2454)	-2.501	-1.865	-1.517
Non oil-countries-5	1981‡	0.9831 (-0.6793)	1	1	0.9826 (-0.5865)	-2,593	-1,887	-1,505

The t-statistic are reported in brackets.

(1) estimated coefficient for $t \leq TB$ *and (2) for* $t > TB$ *where TB is the estimated time break.*

l_i *is the optimal lag length for the period* t_i *for* $i=1,2$.

**** (**) (*) : the null of a unit root is rejected at 1% (5%) (10%) level*

‡‡ (‡) he null of no break is rejected at *5% (10%) level.*

4.4.2- Panel unit root with endogenous break for the period of 1960 to 2000

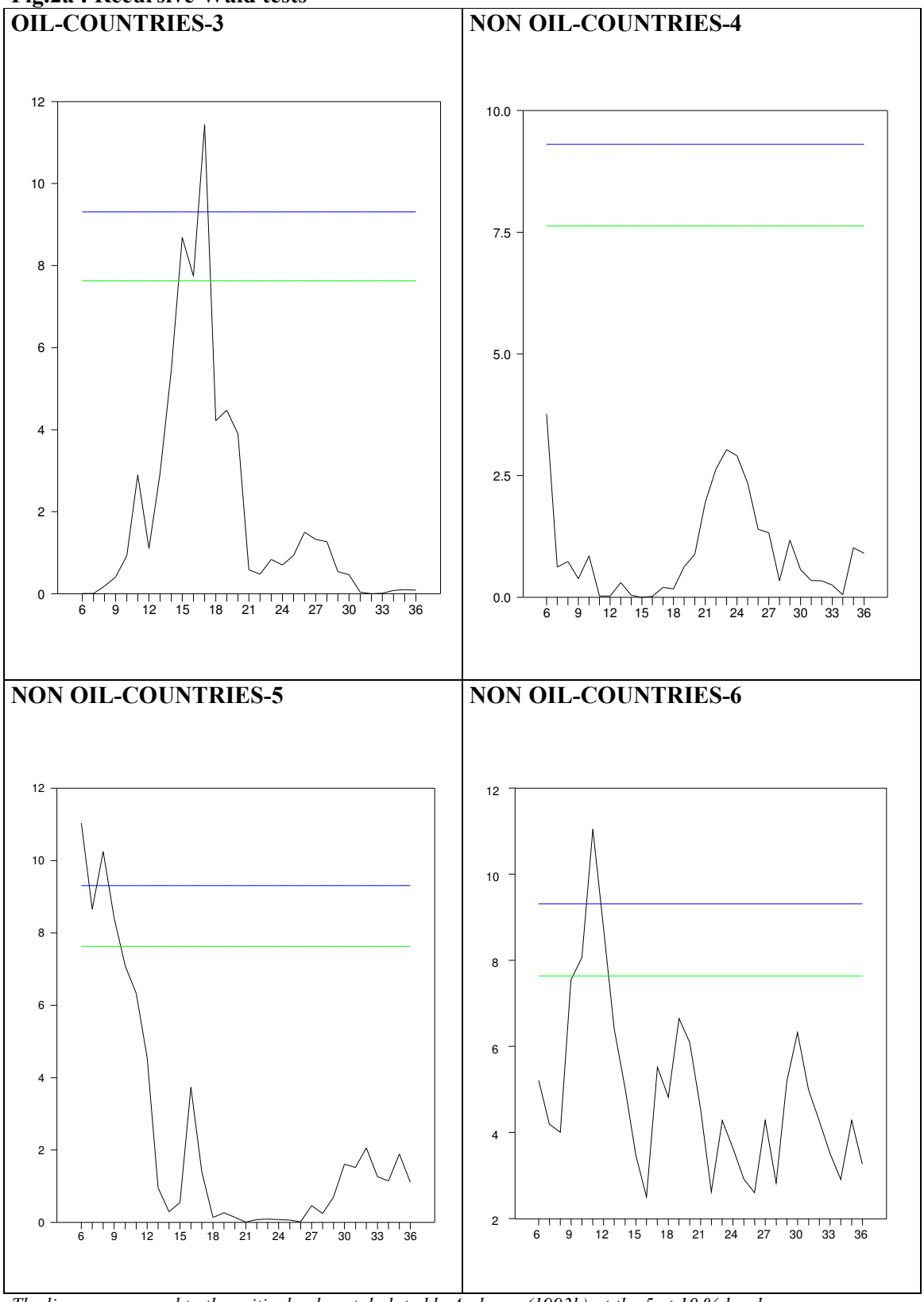
As reported In Fig2a-c, we reject the null hypothesis of parameter stability at the 5% level for Oil Countries-3 and Non-Oil Countries-6, and at 10% Non-Oil Countries-5. The null of no break is only accepted at standard level for Non-Oil Countries-4 and Non-Oil Countries-7.

Contrarily to the time breaks during the period 1960 to1990, who were in the late 70's and early 80's, during this period 1960 to 2000 the breaks are located from the middle of 60's to the middle of 70's.

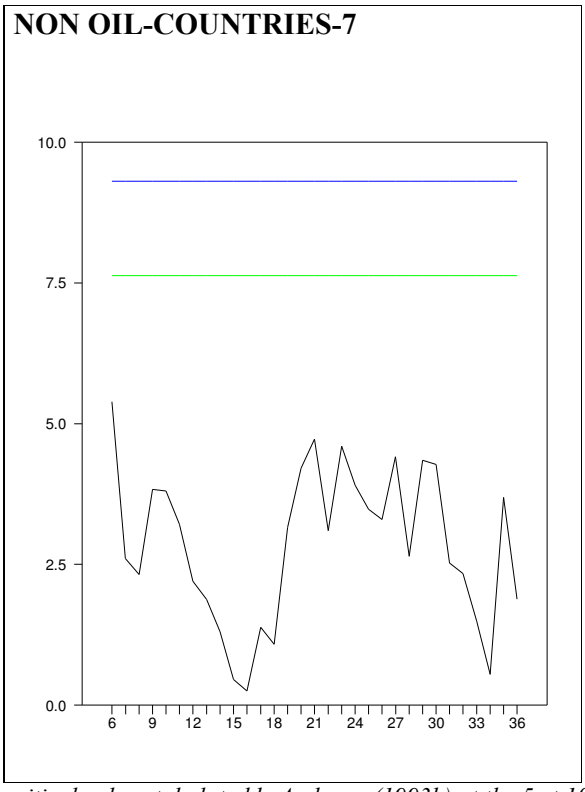
The estimated Non-Oil Countries-4 break in 1965 is not significant. But the unit root test shows that before this date these countries were more integrated. This break date correspond to the beginning of trouble between Israel in one hand, Jordan and Syria in the other, witch contribute to breaking out in June 1967 the third Arab-Israeli war. It lasts only six days, and, thus, is familiarly known as the "Six Day War". The same date comes out for Non-Oil Countries-7, were again it's not significant and Jordan is one of the countries group.

Whereas, for Non-Oil Countries-5 1965 is a significant break date at 10% level. The catching-up hypothesis is accepted before 1965 for the countries group. We note that Egypt, who is a leader in the Arab coalition during the 1967 six days war, is a member of this group. For Non-Oil Countries-6 the breaking date is 1970. It is significant at 5%, the countries group (Morocco, Tunisia, and Jordan) converge before 1970 at 1% level. The year 1970 is marked by "Black September" Events. A temporary cease-fire in the war of attrition is accepted by Egypt, Israel, and Jordan. A break in 1976 for Oil countries-3 group is significant; group members are catching-up each other after 1976. The same phenomenon was observed for the data from 1960 to 1990, but 1976 break date wasn't significant.

Fig.2a : Recursive Wald tests



The lines correspond to the critical values tabulated byAndrews (1993b) at the 5 et 10 % level.



The lines correspond to the critical values tabulated byAndrews (1993b) at the 5 et 10 % level.

Table n° 2 : Quah's panel unit root with an endogenous break

Groups	TB	$\hat{\phi}_{t_1}$ (1)	l_1	l_2	ϕ_{t_2} (2)	Critical Valuess		
						1 %	*5%*	*10 %*
Oil Countries-3	1976‡‡	1.0234 (0.9276)	0	4	0.9350*** (-3.5238)	-2.590	-1.844	-1.478
Non oil-countries-4	1965	0.8424* (-1.7743)	0	0	0.9813 (-0.8202)	-2,559	-1.860	-1.501
Non oil-countries-5	1965‡‡	0.7740** (-2.4176)	0	0	1.0077 (0.5085)	-2.627	-1.918	-1.534
Non oil-countries-6	1970‡‡	0.8170*** (-3.2379)	0	4	0.9925 (-0.2798)	-2.492	-1.878	-1.525
Non oil-countries-7	1965	0.8791*** (-2.9440)	0	2	0.9846 (-0.8626)	-2.551	-1.836	-1.467

The t-statistic are reported in brackets.

(1) estimated coefficient for $t \leq TB$ *and (2) for* $t > TB$ *where TB is the estimated time break.*

l_i *is the optimal lag length for the period* t_i *for* $i=1,2$.

**** (**) (*) : the null of a unit root is rejected at 1% (5%) (10%) level*

‡‡ (‡) he null of no break is rejected at *5% (10%) level.*

A serious problem with Quah's panel unit root test applied to the convergence issue is that the null hypothesis of income convergence is tested against the alternative of absolute convergence. Rejection of the convergence hypothesis can be a consequence of a too restrictive alternative hypothesis. In the next section, we will apply a less restrictive panel unit root test which consists on examining if there is some conditional convergence occurring to the countries for which the catching-up hypothesis has been refused.

5- TESTING THE CONDITIONAL CONVERGENCE HYPOTHESIS IN MENA

5.1- The Evans & Karras' approach

The conditional convergence hypothesis consists in testing if the true value of the coefficient ρ equals zero in the following regression (Evans & Karras, 1996 and Evans, 1998):

$$(16) \qquad \Delta\left(y_{nt} - \bar{y}_t\right) = \delta_n + \rho\left(y_{nt-1} - \bar{y}_{t-1}\right) + \sum_{i=1}^{p} \varphi_{ni} \Delta\left(y_{nt-i} - \bar{y}_{t-i}\right) + u_{nt}$$

where u_{nt} is supposed to be uncorrelated across economies[††]

δ_n Stands for individual fixed effects for country *n*.

He tests the null hypothesis of divergence H_0 $\rho = 0$, in three stages:

- The first stage consists in estimating the equation by the OLS to obtain an estimator of the standard deviation of the residues: $\hat{\sigma}_n$ this makes it possible to build standardized series $\hat{z}_{nt} \equiv \left(y_{nt} - \bar{y}_t\right)/\hat{\sigma}_n$ for each individual of the panel.
- The second stage consists in considering the model represented by the equation (17) by the OLS to obtain the value of the estimator $\hat{\rho}_{mco}$ and its t-student, $t(\hat{\rho}_{mco})$

$$(17) \qquad \Delta\hat{z}_{nt} = \hat{\delta}_n + \rho\hat{z}_{nt-1} + \sum_{i=1}^{p} \varphi_{ni} \Delta\hat{z}_{nt-i} + \hat{u}_{nt}$$

où $\qquad \hat{\delta}_n = \dfrac{\delta_n}{\hat{\sigma}_n}$ et $\hat{u}_{nt} = \dfrac{u_{nt}}{\hat{\sigma}_n}$

[††] The existence of a common effect in the *u's* are eliminated by the demeaning procedure.

- The third stage then consists in carrying out the test of unit root: if $t(\hat{\rho}_{mco})$ is higher than a breaking value gives, then one rejects the null hypothesis of divergence, $H_0\ \rho = 0$, with the benefit to the hypothesis of convergence.

Under the null hypothesis H_0, $t_{\hat{\rho}}$ converges in distribution to standard normal as T and N approach infinity while N/T approaches zero. Unfortunately, the asymptotic distributions of $t_{\hat{\rho}}$ do not accurately approximate the distribution for the samples that we consider. For that reason, we employ Monte Carlo simulations to provide approximate distributions for inference.

We used Evans & Karras's method in order to estimate the critical values. First, we used ordinary least squares to estimate the parameters of the null model for each group of countries:

$$(17) \qquad \Delta\left(y_{nt} - \bar{y}_t\right) = \delta_n + \sum_{i=1}^{p} \varphi_{ni} \Delta\left(y_{nt-i} - \bar{y}_{t-i}\right) + u_{nt}\,.$$

Second, we generate an ($N \times T$) panel of simulated random walks with drift by drawing from an $N\left(\hat{\delta}_n, \hat{\sigma}_u^2\right)$ for *n=1,...,N*. Third, we run Evans & Karras's panel unit root test on this simulated data. Finally, we repeat this experiment 10000 times and then pick-up the critical values of the *t*-statistic.

Evans & Karras's approach is extended to take into account a possible downward bias in the panel unit root test (Bernard & Jones, 1996). Indeed, Andrews (1993b) has shown that with time series (*N=1*) the autoregressive coefficient estimator of the unit root test presents a downward bias in small samples. According to Bernard & Jones (1996), this result can be generalized to the panel data unit root tests.

Andrews (1993b) solves the problem under the null hypothesis of unit root by adjusting the coefficient estimator by a bias calculated by Monte Carlo simulations. The bias is calculated with same Monte Carlo simulations as the critical values. When we perform the 10000 panel unit root tests, we calculate then the median bias in the estimate of ρ. The adjusted estimate of

ρ is equal to the raw point estimate plus this median bias correction term, producing the median-unbiased estimator of Andrews.

Results of the different estimations are reported in Table 9. The optimal lag length has been estimated by the Akaike AIC criteria. We notice that the bias on small samples is maybe important. Indeed, if the coefficient is not corrected, then a point estimate less than one is estimated within five cases on seven, but only in one case on seven once the coefficient has been adjusted[‡‡].

Taking into account fixed individual effects does not change drastically the results concerning the convergence hypothesis. The conditional convergence hypothesis tests draw the same conclusions as the absolute ones.

5.1.1- The Evans & Karras' approach results for the period of 1960 to 1990

The unit root hypothesis is not rejected even at a 10% level for all these groups of countries. A speed up of the per capita income divergence phenomena is even estimated for Middle East-6. The adjusted coefficient is more than one for Middle East-6. Although for the other two groups the estimated coefficient is less than one, the null of a unit root is accepted. So we cannot conclude that the groups of countries tend towards the same growth rate in the long run. Indeed, the conditional convergence hypothesis is refused in each case.

However, those results can proceed from the fact that the alternative hypothesis in the modified Levin & Lin unit root test is yet too restrictive. Indeed, it is supposed that under the convergence hypothesis that the coefficient ρ is the same for all the countries in the sample which implies that all the countries will convergence at the same rate to the steady state.

[‡‡] Not taking into account this downward bias in panel unit root tests with fixed individual effects may explain the results in favour of the convergence hypothesis found by Evans & Karras (1996) and Evans (1998).

Table n° 3: Modified Levin & Lin panel unit root test

Groups	N.T	$\hat{\phi}$	$\hat{\phi}_{adjusted}$	$t_{\hat{\phi}_{adjusted}}$	*l*	Critical Values		
						1 %	*5%*	*10 %*
Middle East-6	124	0.7510	0.8584	-2.36 (-4.1499)	0	-4.7042	-4.1247	-3.7840
Oil Countries-3	93	0.9289	1.002	0.0475 (-1.6855)	0	-4.1355	-3.4518	-3.1272
Non oil-countries-5	93	0.8694	0.9651	-0.6966 (-2.6051)	1	-4.3476	-3.7064	-3.3422

We allow in all the regressions for individual fixed effects (not reported here).
In brackets are reported the t-statistic for the raw coefficient.

5.1.2- The Evans & Karras' approach results for the period of 1960 to 2000

The adjusted coefficient is more than one for Non oil-countries-4. The unit root hypothesis is not rejected for the two groups of countries Non oil-countries-4 and Non oil-countries-7 during the period of 1960 to 2000.

Table n° 3: Modified Levin & Lin panel unit root test

Groups	N.T	$\hat{\phi}$	$\hat{\phi}_{adjusted}$	$t_{\hat{\phi}_{adjusted}}$	*l*	Critical Values		
						1 %	*5%*	*10 %*
Non oil-countries-4	123	0.8127	0.8956	-1.9478 (-3.4951)	0	-4.3939	-3.7557	-3.4496
Non oil-countries-7	164	0.9097	0.991	-0.2711 (-2.7212)	0	-4.7010	-4.0841	-3.7672

We allow in all the regressions for individual fixed effects (not reported here).
In brackets are reported the t-statistic for the raw coefficient.

This refusal result of conditional convergence for all the groups and during the two periods of study can be due to a change of behaviour in the process of growth of the countries.

5.2- Conditional convergence and endogenous break

We apply again Andrew's recursive Wald approach to test for parameter stability of the conditional convergence regression. The results of the annual recursive Wald statistic are reported in Fig.2a-b. For each group the null hypothesis of parameter stability is rejected at

the 5% level[§§]. We show in addition that all the estimated ruptures are at the end of the 60's and the middle of the 70's, a critical period for the region marked by wars and oil crises

5.2.1- Conditional convergence and endogenous break during the period 1960 to 1990

For the Middle East-6 group, the break is estimated to occur in 1974, witch coincides with the first oil chock. Even if this break is significant at 5% and the estimated autoregressive coefficients are lesser than one before 1974 (0.3033), and after (0.9065), the null of a unit root is accepted in the two periods at the 10% level. But, we notice that the *t*-statistic before 1974 are much closer to the critical values than after.

The results concerning the Oil Countries-3 are quite different from those of the precedent group. The break date is significant at 5% and estimated to occur at 1977, witch is closer to Arab-Israeli war of 1976 involving the group countries. We estimate a coefficient lesser than one before 1977 (0.7104), and after (0.7715). In both cases the null of a unit root is rejected, at the 10% level before 1977, and at the 5% level after. Hence, the conditional convergence hypothesis becomes stronger between Oil Countries-3 countries after 1977.

For the Non oil-countries-5 members, the break is estimated to be in 1969, it is also significant at 5%. Before this time break the null of a unit root is rejected at 1% level, and hence the conditional convergence is accepted. We conclude from it that the countries of the group Egypt, Morocco and Tunisia converged in rate before 1969. This year marks the launching of the raids of Gamel Abd Ennacer against Israel, which will be at the origin of the war of 1973 started by his successor at the precedence of Egypt Annouar el Sadat and Syrian president Hafed El Assad.

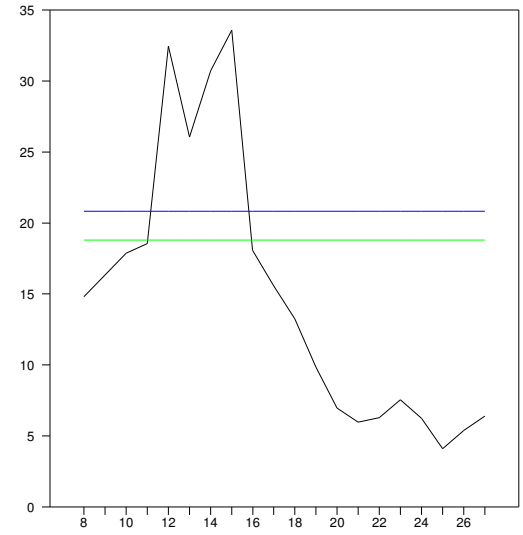
[§§] We comment only the results for the median adjusted coefficient. From table 5, we notice the importance of making such an adjustment. Indeed, applying the raw estimate makes the conditional convergence hypothesis much more likely, because the tests statistics are all close to the 10% level.

Table n° 5 : Modified Levin & Lin's test and endogenous break

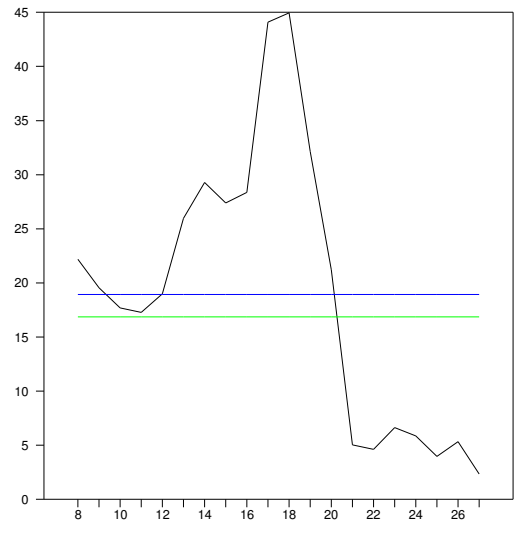
Groups	TB	$\hat{\phi}_{t_1}$ (1)	$\hat{\phi}_{t_1}^{ajusté}$	l_1	l_2	ϕ_{t_2} (2)	$\hat{\phi}_{t_2}^{ajusté}$
Middle East-6	1974 ‡‡	0.1959 (-3.3753)	0.3033 (2.831)	1	1	0.7991 (-3.0138)	0.9065 (-1.4040)
Oil Countries-3	1977 ‡‡	0.6373 (-3.9651)	0.7104* (-3.1661)	0	1	0.6984** (-4.8690)	0.7715 (-3.6888)
Non oil-countries-5	1969 ‡‡	0.3869 (-5.6898)	0.4826*** (-4.8018)	0	1	0.7048 (-4.5928)	0.8005 (-3.1041)

Fig.3a: Recursive Wald Tests

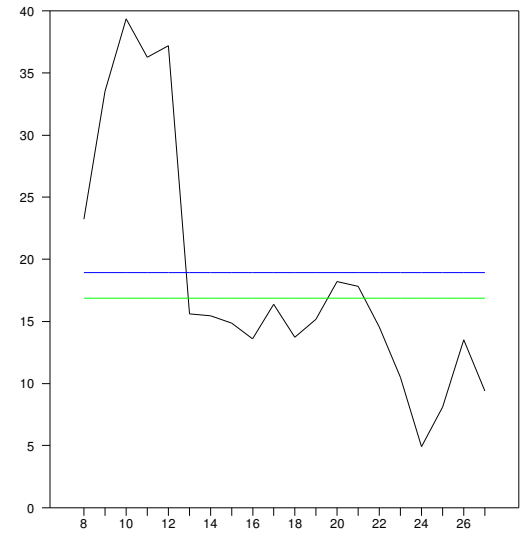
Middle East-6



Oil Countries-3



Non oil-countries-5



The lines correspond to the critical values tabulated by Andrews (1993b) at the 5 et 10 % level.

5.2.2- Conditional convergence and endogenous break during the period 1960 to 2000

In, Non oil-countries-4 the unit root hypothesis is rejected at 5% level before 1968 again a significant date for the region and accepted after. This date is very close to the 6 days war of 1967. Conditional convergence hypothesis is then occurring in Non oil-countries-4 before 1968.

The hypothesis of conditional convergence is rejected for Non Oil-countries-7, in spite of the taking into account of a significant rupture with 5% in 1991. This date marks a turning for the countries of the group: Morocco, Tunisia, Jordan and Turkey. However; these economies remain divergent before and after this year is marked by a major event, the war of the Gulf, is carried out by a coalition of country against Iraq to release Kuwait, invaded in 1990. 1991 are also the year of the conference of peace of Madrid which joined together for the first time Israel and its neighbours in order to launch a new surface of stability in the area.

Table n° 5: Modified Levin & Lin's test and endogenous break

Groups	TB	$\hat{\phi}_{t_1}$ (1)	$\hat{\phi}_{t_1}^{ajusté}$	l_1	l_2	ϕ_{t_2} (2)	$\hat{\phi}_{t_2}^{ajusté}$
Non oil-countries-4	1968 ‡‡	-0.0395 (-4.6740)	0.0434** (-4.3012)	0	1	0.8137 (-3.0927)	0.8966 (-1.7166)
Non oil-countries-7	1991 ‡‡	0.8718 (-3.1045)	0.9531 (-1.1352)	1	1	0.5649 (-2.1377)	0.6478 (-1.7305)

The t-statistic are reported in brackets.

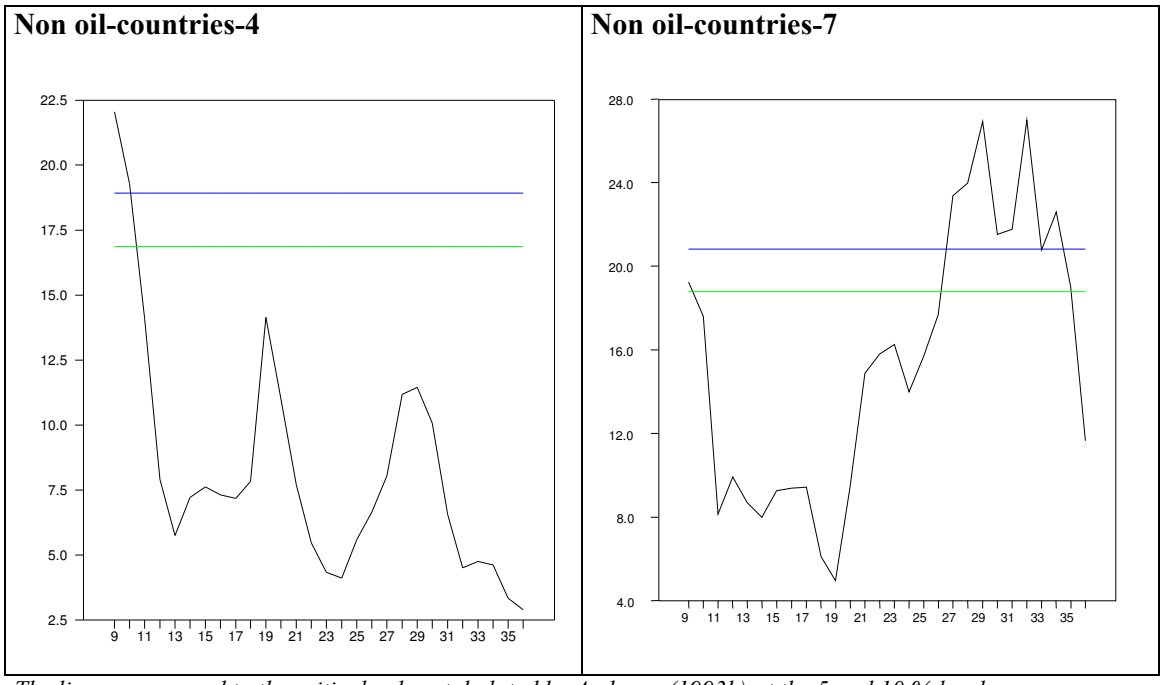
(1) estimated coefficient for $t \leq TB$ *and (2) for* $t > TB$ *where TB is the estimated time break.*

l_i *is the optimal lag length for the period* t_i *for* $i=1,2$.

**** (**) (*) : the null of a unit root is rejected at 1% (5%) (10%) level.*

‡‡ (‡) he null of no break is rejected at *5% (10%) level.*

Fig. 3b : Recursive Wald Tests



The lines correspond to the critical values tabulated by Andrews (1993b) at the 5 and 10 % level.

Thus, during the first period of study, the only group which does not show any convergence, not absolute nor conditional; even by holding account of the possible ruptures of behaviour, is Middle East-6. This group is composed of four countries: Egypt, Jordan, Syria and Turkey. For the second period of study (1960 to 2000), the group of country which proves no convergent is Non oil-countries-7. The countries that form part of this group are Morocco, Tunisia, Jordan and Turkey. This result of divergence can be due to a restrictive alternative assumption of the test of Levin & Lin modified. Indeed, this test supposes that in the case of convergence, the coefficient ρ is identical for all the countries of the group, which means that they converge at the same growth rate towards their stationary balances.

5.3- Convergence at different rates to the steady state

In order to test for the convergence hypothesis, the best is to use panel unit root tests which allow some heterogeneity between the countries in the panel. Hence, we will apply in this

sub-section the IPS test for unit roots in heterogeneous panels which relax the assumption that all the countries converge at the same rate[***].

According to Maddala & Wu (1996), the IPS test requires a balanced panel and to make use of their tables we are restricted implicitly to use the same lag length for all the ADF (p_n) regressions for individual series[†††]. There is no available process to estimate this optimal lag length. We have chosen a two step procedure. First, we use the Akaike AIC criteria to estimate the optimum lag length (p_n) for each individual ADF regressions. Second, we choose the final lag length (p) to include in all the regression of the IPS test as the maximum value of the individual p_n[‡‡‡].

The null hypothesis of unit root is rejected if the statistics of the test ($\Psi_{\bar{t}}$) are lower than the breaking values. The conditional convergence hypothesis is accepted at 10% level for Middle East-6 group during the period of 1960 to 1990, at different speed levels for Egypt, Jordan, Syria and Turkey (cf. tableau 10).

For the group Non oil-countries-7 formed by four non oil-countries: Morocco, Tunisia, Jordan and Turkey, conditional convergence hypothesis is rejected for the whole period 1960 to 2000, even at various speeds. These countries converge neither in rate nor in level. Ultimately, for this group of country, the rejection of the assumption of conditional convergence does not come from the restrictive assumption of a convergence at the same rate. Studying the growth performance of the countries, Tunisia carried out the highest growth rate of the sample over this period of 1960 to 2000. So, the empirical result can be explained by an exceptional economic performance of one of the countries of the group (Tunisia). Tunisian growth accelerated especially after its engagement in the economic reforms in 1986, with the support of International Monetary Fund (IMF), within the framework of a plan of structural adjustment. This country thus could take off remainder of the group, which would explain its divergence. On the opposite, in term of economic growth, Jordan is late compared to the other

[***] Maddala & Wu (1996) are the first to criticise the modified Levin & Lin panel unit root test applied to the convergence issue using this kind of argument.
[†††] To our knowledge, Lee, Pesaran & Smith are the first to apply the IPS test to the convergence issue.
[‡‡‡] Our lag length selection approach must over-estimate the true lag length. IPS's Monte Carlo simulations show « *the importance of correctly choosing the order of the underlying ADF regressions. The problem is particularly serious when the order is underestimated. The situation is different, however, when the orders of the underlying ADF regressions are correctly chosen or over-estimated* » (IPS, 1996 p. 14).

countries of the group because of the fall of its incomes after the Gulf war 1991, of the clear regression of the financial assistance of Saudi Arabia and Kuwait, and the fall of the transfers of currencies of the Jordanian workers employed in the States of the Arabic peninsula. The country also suffered from the embargo issued by the United States on all the goods in source and bound for Iraq, even if an exchange continues "clandestinely". A positive evolution of the peace process in the Middle East region and standardization of the situation in Iraq would be great for Jordan economic situation.

According to this economic situation, we decided to test convergence at different speeds for the group Non oil-countries-7, without Jordan initially and Tunisia then. Our intuition is confirmed by the results obtained (see table 10). Indeed, the exclusion of Tunisia of the group allows a convergence at 10% level, which confirms that, this country in accelerating growth period, not shared by the other members of the group. On the other hand, the elimination of Jordan does not change the result of divergence of the group.

Table 10 : the Im, Pesaran & Shin test

	$\Psi_{\bar{t}}$	$\bar{t}_T$	$p = Max(p_n)$
Middle East-6	1.8710	-2.3579	3
Non oil-countries-7	0.6790	-1.8030	2
Non oil-countries-7 without Tunisia	1.8811	-2.4643	4
Non oil-countries-7 without Jordan	0.5175	-1.7852	0

Critical value at 5% (10%) : -1.65(-1.28)
The $\Psi_{\bar{t}}$ are in absolute value.

6- CONCLUSION

This article aims to test the convergence hypothesis in MENA using new tests of a unit root in panel data. These new tests result from the empirical literature most recent on the question. It extends the tests of unit root on time series to the data of panel. The various procedures of tests, exposed and used in this article, allow us to conclude to the presence or the absence of convergence, within a sample of MENA region country. We proceeded to the realization of this study over two periods: from 1960 to 1990 and 1960 to 2000.

The study of absolute convergence during the two periods considered enabled us to find positive results for the majority of the groups. It is amazing to note that the whole of the countries of the sample gathered in MENA is convergent during the whole two periods. Moreover, all the groups are characterized by an estimated value of the autoregression coefficient lower than one. This proves certain homogeneity of the sample, in spite of an apparent diversity of the economic structures of the various countries. Indeed, we showed that the countries share several socioeconomic characteristics and a similar political environment.

During the first period of study (1960 to 1990), the assumption of stationary is rejected for only for five studied groups out of the 20. They are oil groups in majority: Middle East-6, Oil countries-1, Oil countries-2, Oil countries-3 and Non oil countries-5. For the second period going from 1960 to 2000, the hypothesis of catching-up is rejected for five groups among the 17 considered. In opposition to results of the first period, these divergent groups are essentially not oil producers: Oil countries-3, Not-Oil countries-4, Not-Oil countries-5, Not-Oil countries-6 and Not-Oil countries-7.

Not taken into account in the unit test of root, of the approach of Ben-David, a possible break in the process of development of the countries can explain the result of absence of catching-up for certain studied groups. In order to cure this insufficiency, we proceeded to the realization of tests of recursive Wald to determine the optimal rupture, represented by the date for which the statistics of Wald are the maximum.

We note that the introduction of a break allows a convergence of the oil countries groups of the first period study after the date of break which corresponds approximately to the second oil crisis. From this date, the oil countries proceeded to a broader opening and an attempt at

diversification of their economies, which supported their convergence. On the other hand, during the second period of study, the introduction of break enables us to find a convergence of non oil groups before these dates. These last correspond rather to the wars which have occurred in the zone, economic politic shocks which caused after while the divergence between these countries.

The other important weak point of Ben-David approach is that it considers only situations where, either the countries completely catch up with the levels of incomes of the developed countries, or they diverge. We tested, consequently, the hypothesis of absolute convergence against that of divergence. The results of refusal of the hypothesis of convergence can thus come from the rejection of the too restrictive alternative hypothesis. With an aim of raising this limit, we took into account the presence of individual fixed effects in the tests of unit root applied to the groups of country for which the catching-up hypothesis was refused. With this intention, we used the step of Evans & Karras (1996) and Evans (1998), which makes it possible to test conditional convergence by introducing the specific fixed effects to each country.

Conditional convergence is rejected for the whole period 1960 to 1990, for three groups: Middle East-6, Oil countries-3 and Non oil-countries-5. The same result of divergence is found for the groups of the second period of study (1960 to 2000): Not oil-countries-4 and Non oil-countries-7 we still took once again the method of the SupWald recursifs tests of Andrews (1993a) deferred in Fig.2a and 2b. In all the analyzed groups, and for the two periods of study, the hypothesis of stability of the equation is rejected at 5% level. For both period of study and in accordance with the results of absolute convergence following the introduction of a break of behaviour, the group of oil country proves to be convergent after the date of break between the two oil crises of 1973 and 1979, whereas the non oil countries groups converge before the date of break corresponding to political wars and crises which occurred in the area. Thus, the oil countries would converge better after the oil crises and the non oil countries especially most involved in the region war, would converge better before the release of these last.

The only group diverging even in rate on the period 1960 to 1990 is Middle East-6, although it presents significant breaking date in 1974 corresponding at least at the first oil crisis. During the period 1960 to 2000 convergence remains always rejected for the Non oil-

countries-7 group, in spite of significant breaking date in 1991, the year marked by the Golf war.

We considered the fact that the rejection of the assumption of conditional convergence for a group of country in each of the two studies can be due to a restrictive alternative assumption of the modified test of Levin & Lin. This test supposes that all the countries of the considered group converge at the same speed. To eliminate this problem we applied the Im, Pesaran & Shin (1996) test which consider that under the alternative assumption of conditional convergence, each country converges towards its stationary balance at its rhythm. This convergence is known as a conditional convergence at different speeds.

The hypothesis of conditional convergence at different speeds is accepted at 10% level for the Middle East-6 group made up of: Egypt, Jordan, Syria and Turkey, during the period of 1960 to 1990. However, even at various rates of growth the Non oil-countries-7 group remains divergent on the whole period 1960 to 2000. Examinating the economies which make this group, Morocco, Tunisia, Jordan and Turkey we note that Tunisia presents a higher growth compared to that of the other countries, it would seem that it is distinguished from the remainder of the group. While following this intuition we tested conditional convergence at different speeds which confirm that Tunisia takeoff from the group what be at the origin of the divergence result.

This takeoff of the Tunisian economy compared to those of the other countries of the group occurred especially after the Golf war in 1991 what explains the appearance of this date like a breaking date in the behaviour of the development process of the group countries in the conditional convergence test with endogenous break. Moreover, this group was convergent in a non conditional way over the study period before the Golf war of 1991, going over 1960 to 1990. In addition this result confirms the importance of the exogenous shocks effect on the process of growth and consequently on that of the convergence of the countries. Socio-politic stability also seems a determinant key of the MENA zone growth. Indeed, the dates of break in the strategies of growth of the MENA countries, as well for absolute convergence tests as for the conditional convergence tests, correspond into major part to those of policies crisis and wars.

The MENA area is known to be one of the most heterogeneous areas under development in the world in term of economic structures and development levels. Testing the region countries convergence is often disputed. However, we highlight, in a formal way, the presence of a strong movement of incomes convergence in the MENA region and proved the existence of convergence clubs in this area.

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